
ICEPIC

USER'S GUIDE

ICECO

INTEGRATED COMPUTER EQUIPMENT COMPANY



I C E P I C
U S E R ' S M A N U A L
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I N T R O D U C T I O N

This manual will help you to get the most out of your new ICEPIC. To begin with, we at ICECO would like to thank you for purchasing the ICEPIC. We want you to receive years of trouble-free service and suggest that you read the installation and checkout portion of this booklet (at least). To insure that you do not damage your computer, printer, or ICEPIC, make sure to follow the instructions. After hooking up your ICEPIC, you must load an ICEPIC program (driver) to make use of your ICEPIC -- this manual will tell you which program to use. In addition, we have provided you with many other useful programs -- you should read the instructions in this booklet to properly use most of them.

The ICEPIC has many features, both in its hardware and in its supporting software -- they are summarized below.

H A R D W A R E F E A T U R E S

- Supports any printer which uses a parallel (Centronics) interface.
- Supports printers which can also be used by non-Atari computers.
- Supports printers being used by next generation Atari computers.
- Uses only one "joystick" port.
- Requires no additional interface (850) "box".
- Requires no modifications to the Atari or the printer.
- Compact size takes up virtually no desk space.
- Requires no bulky external power supply and power cord.
- Needs no extra (expensive) cable to connect it to the printer.
- Can be extended by low cost "joystick" extension cords.
- Provides more complete printer status for application programs.
- Can run simultaneously with a modem interface.

SOFTWARE FEATURES

- Can be used as a "normal" printer with most application programs.
- Requires no program modifications.
- Resolves most of the "bugs" in the standard printer software.
- Can print any 8-bit character to the printer.
- Data is sent to the printer immediately -- no wait for end-of-line.
- Detection and recovery when printer goes off-line.
- Supports Epson and Okidata compatible printer graphics.
- Most special functions can be keyboard or program activated at any time.
- Application programs are unaware of keyboard activated functions and no program changes are required.
- Optional simultaneous "hardcopy" of any screen output.
- Printout of any logical line of text on the screen.
- Printout of all screen text lines.
- "Graphic" printout (dump) of any screen.
- Several screen dump formats including multiple gray shades and variable printed dimensions.
- "Atari" font or user-defined font printing.
- Rotation and expansion of "Atari" or user fonts.
- "Translated" printing for control characters and inverse data.
- Makes it simple to list programs containing control characters.
- Disk dump and restore of any screen.
- Disk dump and restore of character tables.
- "Warm" re-boot capability.
- And many more.

You should note that many of these features, such as screen dump to print, screen dump to disk, and printing with multiple user fonts, usually require separate programs. These programs can each cost nearly as much as your ICEPIC. In addition to these software features, the ICEPIC provides hardware functions of boxes and cables costing much more than it does. In short, you received a lot when you bought an ICEPIC -- we know that you will appreciate it even more after you have used it for a while.

EQUIPMENT NEEDED

1. Atari Computer: 400, 600XL, 800, 800XL, or 1200XL.
2. A printer equipped with a parallel, Centronics compatible, interface.
3. A disk drive and a DOS diskette.
4. ICEPIC and ICEPIC support software diskette.

ICEPIC FUNCTION

The name ICEPIC is an acronym for Integrated Computer Equipment Parallel Interface Converter. The ICEPIC is an electronic circuit which connects any parallel interfaced printer to most Atari computers. The ICEPIC contains electronic circuits to convert the electrical signals needed by the printer to those used by the Atari. The circuitry is housed in a compact case which also contains a molded-in plug to connect the ICEPIC into the printer's parallel (Centronics) interface jack. A "joystick" type plug and cord connects the ICEPIC into one of the Atari controller jacks (joystick port). The ICEPIC gets its power (a very small amount) from the computer, so it needs no additional power supply. The ICEPIC is needed because the printer requires many more signal lines than a joystick port can provide. The ICEPIC provides everything needed to hook up a printer: interface circuitry and cable. Since Atari operating system (OS) software is not designed to have a printer connected into the joystick ports, some special software is required to make the ICEPIC work. This software is provided with the ICEPIC. In addition, the ICEPIC software provides many additional features not normally available on the Atari with a more "standard" printer connection.

ICEPIC DOCUMENTATION

This manual was prepared with AtariWriter and printed by AtariWriter using an ICEPIC connected to an Okidata Microline 92 printer. An ICECO proprietary proportional spacing print driver was used to more evenly spread the "justified" spacing produced by AtariWriter. The printout was photographically reduced for final printing. The label on your software diskette was printed using your ICEPIC in its final operational check.

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I N S T A L L A T I O N

Installation of the ICEPIC is a two part procedure. First, the hardware (ICEPIC "cable") must be connected between your computer and printer; and second, the necessary "driver" program must be loaded.

HARDWARE SETUP

1. Turn off the power to both the computer and the printer.
2. Plug the circuit (big) end of the ICEPIC into the parallel (Centronics) connector on your printer. For most printers, the cord will be pointing to the right when you are facing the front of the printer (it will only go in one way and it is a snug fit, but don't force it -- yours may go in the other way around).
3. Plug the "joystick" end into game port 2 (you may use port 4 on non-XL computers).
4. Set your printer setup switch for "automatic line feed" after a carriage return to "on" (see the manual which came with your printer for details).
5. Turn on the power for the computer and the printer (and your disk drive).
6. Boot DOS as usual.

IMPORTANT !!! Always turn off the power to both the printer and the computer before you connect or disconnect the ICEPIC. Failure to do so may damage your computer or your printer or your ICEPIC.

You may turn the power off to the printer when you are not using it. You should note that most printers will set "top of form" when you turn the power back on. If you turn off the power to your Atari computer, the ICEPIC will NOT reset your printer (to avoid losing the "top of form" setting).

This completes the hardware setup. Normally you can keep your printer and computer connected by the ICEPIC. If you find the ICEPIC cord to be too short, it can be extended up to twenty feet or more by game port extension cords (available from ICECO and many other sources). If you want to easily switch between the ICEPIC and any other joystick device, you may be interested in another ICECO product, the ICETEE game port switch box -- with it you can switch at any time and you also have a four foot extension cable.

SOFTWARE BACKUP

ICEPIC software is distributed on a write-protected (not copy protected) diskette in DOS 2 format (single density); the diskette does not contain a copy of DOS (it cannot be booted). You must supply whatever version of DOS you prefer to use. Eventually you will copy only the driver programs you will be using onto your diskette from the ICEPIC diskette. Before you do this, however, make a copy of the ICEPIC diskette, then save the original as a backup in case you destroy the copy -- never write on the original, since this may void your warranty.

DOS 3 users must use the conversion option (A) to convert programs from the ICEPIC software diskette to another diskette in the newer DOS 3 format. We suggest that you convert everything on the ICEPIC diskette. Keep the ICEPIC original for your backup.

In the instructions which follow, you will be instructed to "load" various programs. You should use the "load program" option or command of the DOS which you are using. The driver programs will "run" and install themselves as required. They return to DOS but remain in memory to "talk" to your printer whenever you do any print functions.

CHECKOUT PROCEDURE

Insert your copy of the ICEPIC diskette in your disk drive and load ICECHK2 if your ICEPIC is plugged into port 2; if you are using port 4, load ICECHK4. This program will check out your ICEPIC and print some test data on your printer to make sure everything is functioning properly. If it fails, it will tell you what seems to be wrong. If you cannot correct the problem, see the chapter on trouble-shooting. If all of the printed data is on the same line, you need to set the automatic formfeed option on your printer -- see the manual which came with your printer for details. ICEPIC software, like 850-type interfaces, requires this option for proper operation.

Note: At this time you are NOT ready to use the ICEPIC -- the checkout program knows how to talk to the ICEPIC, but other programs are not so well informed. They need a "driver" program to send the correct signals to the ICEPIC and thereby make your printer print. The next sections will tell you how to select the driver you need.

SHORTCUT TO USING YOUR ICEPIC

By now, you probably want to "play" with your ICEPIC and your printer. The sections which follow might seem a bit overwhelming right now (in fact, you might not need to know all of the information). So you can try the following "shortcuts" and come back to the nitty-gritty after you have had a chance to become better acquainted with your ICEPIC. If you turn to the chapter on ICEGRAF (page 6.1) and follow the instructions for the ICEGRAF Tutorial, you should get a good idea of what the ICEPIC can do. After that, if you turn to Sample Application Requirements (page 10.1) and find the program(s) you intend to run, you can proceed to follow the instructions listed for them. In any case, if you want to get the most out of the ICEPIC, you should read through all the details and refer back to them when needed.



SELECTING A DRIVER

Since the ICEPIC plugs into a game (joystick) jack instead of the "channel", it cannot be used by the standard operating system (OS) print handler which expects an Atari 850 or similar device on the channel. Instead, a "driver" program must be loaded which will replace the standard OS "P:" print handler. Once this has been done, programs which use "P:" will be unaware of the fact that the printer is connected by an ICEPIC. Unfortunately, the choice of the proper driver program is not always easy because some software does not follow the "standards" for memory utilization (low and high memory address pointers are not always observed).

DRIVER PROGRAM TYPES

ICEPIC comes with three major types of driver programs:

1. Simple "P:" handler (PHANDLER), an enhanced replacement of the Atari OS "P:" handler.
2. Serial I/O simulator (SIOSIM), which intercepts channel I/O destined for the printer and routes it to the ICEPIC instead (needed by programs which do not go through "P:" for printing, such as custom print handlers used by some word processing programs).
3. Multi-function ICEGRAF program, which in addition to both of the functions above includes many other functions, such as: screen dump to print (text or graphic); screen dump/restore to disk; Atari or user font printing; hardcopy of all screen output; and many more.

Each of these driver types will be further described in the sections which follow. ICEGRAF normally is the driver of choice. But since it uses around 4k of memory, there are times when one of the other drivers is required (each of the other drivers use about 256 bytes of memory).

MEMORY AND HARDWARE VARIATIONS

There are several versions of each of the drivers. They are needed because the ICEPIC can use either port 2 or port 4 and because the drivers must be loaded at varying locations in memory based on application program requirements. In addition, Okidata printers use a different graphics format than the more "standard" Epson format (ICEGRAF must be customized to the printer graphics format being used). Rather than have the drivers somehow determine which options you are using (which would make them much larger), several versions of each program are provided.

In general, the drivers can be loaded into page 6 (600 to 6FF hex) or at the current low memory address (MEMLO) or into high memory (RAMSIZ). In the last two cases, the address pointers are changed after the load. So if your application program does not use page 6, you can use a page 6 driver. If your program (and your DOS) respect MEMLO, you can use a low memory driver. If your program respects high memory, a high memory driver can be used. Note that BASIC meets all of these requirements (so long as the BASIC program doesn't get too "fancy").

AUTORUN.SYS FILES

Any of the drivers can be made into an "AUTORUN.SYS" file (by rename or by copy). In addition, other programs can be copy/appended to them to create a compound "AUTORUN.SYS" file. Using "AUTORUN.SYS" is sometimes essential. It is required to use some cartridge programs and it is needed in order to use a "low memory" driver with DOS 2 (DUP.SYS, the DOS 2 "menu" program, does not always respect low memory -- using "MEM.SAV" can sometimes get around the problem, but it is so slow that most users avoid it).

PICKING THE DRIVER YOU NEED

Please refer to the charts in the chapter on "Sample Application Requirements" to help make your decisions. If your program is not listed, try whatever is described for a program similar to it. When you have determined which driver(s) you will be using, copy them to the appropriate diskette(s), renaming them if so desired (for example, to "AUTORUN.SYS" or some other name you can remember easily for loading).

SELF-BOOTING PROGRAMS

Sometimes it is not possible to load any driver. This happens with programs which "auto-boot" and perhaps use a non-standard disk format. However, this can often be resolved by using the ICEPIC "REBOOT" program. REBOOT allows you to first boot normal DOS and load a page 6 or high memory driver from a normal DOS diskette. REBOOT then "fakes" a system boot, keeping the driver in memory. The section on REBOOT will tell you how to use the REBOOT program.

SYSTEM RESET

Pressing [SYSTEM RESET] will usually simply "re-initialize" any of the drivers (as you probably want); however, the high memory versions of ICEGRAF must "sacrifice" part of themselves due to a quirk in the way OS initializes the system (see the chapter on ICEGRAF for more details). Some application programs may process RESET in strange ways and can cause the drivers to "disappear"; you will have to boot the system if this happens.

RE-LOADING A DRIVER

Finally, an important WARNING: Do NOT re-load an ICEPIC print driver (or load a different driver) once any of the ICEPIC print drivers has been loaded. Results are very unpredictable and may lead to problems later. If you must re-load, always boot DOS first.



PRINT ONLY DRIVERS

PHANDLER P: PRINT HANDLER

The ICEPIC "P:" handler program (PHANDLER) replaces the normal OS "P:" handler. In addition to performing the same functions as the standard OS "P:" handler with an "850" connected printer, several enhancements have been added:

1. The "sideways" OPEN option will cause all data to be printed "as is". Thus the end-of-line (EOL) character (hex 9B, CHR\$(155)) does not cause a carriage return and is treated as data. This is useful when printing graphics or downloading a character set (when hex 9B is just data). If "sideways" OPEN is not used, printing an EOL will cause a carriage return (hex 0D, CHR\$(13)) to be printed on the printer (like an 850 always does).

2. When a CLOSE is issued, lines not ending in EOL will not be extended to 40 positions. This solves the problem of using LPRINT with "continued" data (ending with semicolon) -- LPRINT performs an OPEN, PRINT, and CLOSE.

3. Data is sent to the printer immediately (data is not buffered). This can be handy when printing control characters such as a formfeed.

4. If the printer goes off-line during printing, it will not cause an error which could end a program and require reprinting from the beginning.

There are 4 versions of the "P:" handler:

PHANDLER.2LM -- Joystick port 2, loads in low memory.

PHANDLER.4LM -- Joystick port 4, loads in low memory.

PHANDLER.2P6 -- Joystick port 2, loads in Page 6.

PHANDLER.4P6 -- Joystick port 4, loads in Page 6.

SIOSIM -- SERIAL I/O SIMULATOR

The ICEPIC serial I/O simulator program (SIOSIM) "intercepts" serial I/O which was intended to go to a printer on the "channel" (through an 850 interface). SIOSIM is designed for use with programs which do not use the system "P:" routine (such as custom print drivers used by some word processing programs). SIOSIM can be used with the standard OS "P:" handler instead of PHANDLER, but SIOSIM only implements the "sideways" (transparency) enhancement of PHANDLER -- the other enhancements are fixes to the OS "P:" handler.

There are 4 versions of SIOSIM:

SIOSIM.2LM -- Joystick port 2, loads in low memory.

SIOSIM.4LM -- Joystick port 4, loads in low memory.

SIOSIM.2P6 -- Joystick port 2, loads in Page 6.

SIOSIM.4P6 -- Joystick port 4, loads in Page 6.

If SIOSIM functions (or its equivalent functions in IGEGRAF) are used when you also have another printer connected to an Atari 850 or similar interface device, you may get strange results. SIOSIM does not actually intercept serial I/O until after the initial selection sequence is sent over the channel -- this may leave your 850 interface in "limbo" because it will never see any more of the command which appeared to be destined for its printer. It is best to turn off the printer on the 850 to reduce confusion.

G H A N D L E R

DISK GRAPHICS DUMP HANDLER

The ICEPIC disk graphics handler program (GHANDLER) implements a new device, "G:", which allows the current screen (any graphics mode) to be dumped to disk and later restored. GHANDLER also provides functions to dump and restore the current character display table. Unlike most handlers, it is only necessary to "OPEN" the dump file with the proper function code. All actions required to perform the dump or restore will occur during the OPEN. It is not necessary to issue a CLOSE -- a CLOSE is done automatically when the OPEN function is completed. The file specification looks like a normal disk file name with the "D" replaced by a "G". The BASIC format would look like:

```
OPEN #x,f,0,"Gn:filename.ext"
```

Where x = IOCB # (1-7)

f = function code, described on the next page

n = drive number (can be omitted for drive 1)

filename.ext = normal DOS file name and optional extender

Screen dumps will be "compressed" to reduce the data which is written to disk. If any DOS error occurs, the error will be returned by GHANDLER (you will get the same error codes DOS returns). There is a "stand-alone" version of the "G:" handler, GHANDLER.LM, which loads in low memory. The "G:" handler is also included as a part of ICEGRAF, which also includes some keyboard functions to access "G:" (see the next chapter). GHANDLER.LM can be destroyed by DUP.SYS. Use MEM.SAV or make GHANDLER an AUTORUN.SYS to avoid this. Many application programs load at a very low address and assume MEMLO is even lower -- these programs can destroy GHANDLER in the process. In most cases you will probably want to use the ICEGRAF program to get "G:" functions.

GHANDLER FUNCTION CODES

The following function codes are accepted by GHANDLER on an OPEN. Normal DOS error codes are returned if the function fails.

DUMP SCREEN TO DISK

f = 8 -- Write (create) a disk dump of the screen. All information needed to restore the current display will be written to disk. If the file name exists it will be replaced by the new dump.

RESTORE SCREEN FROM DISK

f = 4 -- Read a dumped screen. The current screen GRAPHICS mode must be the same as was in effect when the dump file was created. The screen and display list will be restored to the condition at the time the dump was made. The screen parameters such as cursor position, margins, and color registers will also be restored.

DUMP CHARACTER TABLE

f = 9 -- Dump the current character display table to disk. "CHBAS" points to the table to dump (RAM or ROM).

RESTORE CHARACTER TABLE

f = 5 -- Restore the character display table from a disk dump of it. The current CHBAS must point to the RAM area where the restore will be made.

The character table functions are quite useful if you create your own character set for printing with ICEGRAF. You can save the default system table, and then restore it to a RAM location where you can modify it as desired. Finally, you can dump your custom character set and restore it whenever you need it.

I C E G R A F

MULTI-FUNCTION GRAPHICS DRIVER

ICEGRAF provides all of the functions of the other ICEPIC drivers:

PHANDLER -- P: handler for "normal" printing.

SIOSIM -- Serial I/O simulator for use with other P: handlers.

GHANDLER -- G: handler for disk dump/restore.

In addition, ICEGRAF provides many functions which can be accessed through keyboard commands, independent of the application program which you are running. There are many other functions which can be accessed by "printing" certain control sequences from the application program. These are summarized later and described in detail in the tutorial.

There are several versions of ICEGRAF:

For Epson graphics (Graftrax) and compatible printers:

ICEGRAF.E2L -- Uses joystick port 2, loads in low memory.

ICEGRAF.E4L -- Uses joystick port 4, loads in low memory.

ICEGRAF.E2H -- Uses joystick port 2, loads in high memory.

ICEGRAF.E4H -- Uses joystick port 4, loads in high memory.

For Okidata graphics compatible printers:

ICEGRAF.O2L -- Uses joystick port 2, loads in low memory.

ICEGRAF.O4L -- Uses joystick port 4, loads in low memory.

ICEGRAF.O2H -- Uses joystick port 2, loads in high memory.

ICEGRAF.O4H -- Uses joystick port 4, loads in high memory.

ICEGRAF TUTORIAL

Since the number of ICEGRAF functions is rather large, they can best be understood by example. To help you with this, a tutorial program has been included with the software. To run this tutorial, do the following:

1. Connect your ICEPIC.
2. Boot DOS with BASIC present.
3. Exit to DOS from BASIC (DOS command).
4. Insert your copy of the ICEPIC software diskette.
5. Load ICEGRAF.xxH (See table on page 6.1).
6. Return to BASIC (Run cartridge) and RUN "D:TUTORIAL".

The tutorial will take you through most of the ICEGRAF functions and allow you to experiment with them. If your printer does not support graphics, you will have to skip over many parts of the tutorial since most of the functions work only with graphics printers. When you have completed the tutorial, you will be given a chance to print it all on your printer. All of the commands described in the tutorial are summarized on pages 6.4 and 6.5 of this manual.

ICEGRAF USAGE NOTES

ICEGRAF is a "self-relocating" program. It determines where high or low memory is, relocates itself (changes instruction addresses) and moves itself to high or low memory. It then changes the high or low memory pointers beyond itself. Obviously any program you run should not modify anything beyond the "new" memory address.

The low memory versions work best as an AUTORUN.SYS file along with cartridge based programs. The low memory versions are easily destroyed by most disk based application programs because such applications do not expect MEMLO to be so high (ICEGRAF uses almost 4k) and so the applications are loaded on top of ICEGRAF. The high memory versions work well with any program which respects the top of memory addresses and are particularly useful if you must "REBOOT" to run a program.

There are several things to note when using ICEGRAF. To begin with, if you define your own character display table for the Atari screen it will also be used for printing in "graphic mode". Graphic mode printing is available even if serial I/O simulation is being used (by some word processing programs, for example). Thus, you can include special fonts in documents being printed by your word processor.

The disk functions (G:) may not work when a non-standard DOS is being used. The "disk" functions of the high memory versions of ICEGRAF will not survive a [SYSTEM RESET] because OS insists on clearing a screen area in highest memory before ICEGRAF can change the high memory address; ICEGRAF will "sacrifice" G: to the system because of this -- but the rest of ICEGRAF continues to be functional.

If you run a program which alters the keyboard interrupt vector, ICEGRAF keyboard functions will disappear. Some programs may do keyboard input by scanning the hardware -- this can sometimes lead to undesired results.

ICEGRAF COMMAND SUMMARY

CONTROL COMMANDS

The following commands are recognized in data which is printed in "graphic" mode. "Esc" means the current ICEGRAF escape character, default is ASCII ESC (hex 1B, CHR\$(27)).

- Esc B Use bottom of double high characters
- Esc C Use compressed print and dump width
- Esc D Use downward facing characters
- Esc GA Use Atari font, Graphic mode
- Esc GF Do a printer formfeed
- Esc GG Do a graphic dump to printer
- Esc GI Initialize vectors
- Esc GN Use normal printer font, normal mode
- Esc GP Print all text on screen
- Esc GR Read screen dump from disk
- Esc GT Use "translated" printer font
- Esc GW Write screen dump to disk
- Esc G=Dn:filename.ext Change disk dump file name
- Esc G- Disable switch-to-graphic recognition
- Esc G+ Enable switch-to-graphic recognition
- Esc H Toggle hardcopy
- Esc L Use left facing characters
- Esc Mx Set margin to x 10ths of an inch
- Esc N Use normal width, height, and right facing characters; normal width, black and white dumps
- Esc P Switch to normal passthrough mode
- Esc R Use right facing characters
- Esc S Use multi-colored (shaded) dumps
- Esc T Use top of double high characters
- Esc U Use upward facing characters
- Esc Vabcde Set shaded darkness values, 0-3 for "color" registers 0,1,2,3 and 4 respectively
- Esc [Start underscored characters
- Esc] Stop underscored characters
- Esc =x Change escape character to x (any character)

- Esc Esc Switch to graphic mode (accepted in normal mode data, ignored in graphic mode data)

KEYBOARD COMMANDS

The following commands are recognized from the Atari keyboard anytime after ICEGRAF is loaded. [I/V] = Inverse Video (Atari) Key

[SHIFT]-[I/V] Print line containing the cursor
[CTRL]-[I/V] A Use Atari font, Graphic mode
[CTRL]-[I/V] F Do a printer forafeed
[CTRL]-[I/V] G Do a graphic dump to printer
[CTRL]-[I/V] I Initialize vectors
[CTRL]-[I/V] N Use normal printer font, normal mode
[CTRL]-[I/V] P Print all text on screen
[CTRL]-[I/V] R Read screen dump from disk
[CTRL]-[I/V] T Use "translated" printer font
[CTRL]-[I/V] W Write screen dump to disk
[CTRL]-[I/V] - Disable switch-to-graphic recognition
[CTRL]-[I/V] + Enable switch-to-graphic recognition
[CTRL]-[SHIFT]-[I/V] Toggle Hardcopy

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ACCESSING THE ICEPIC HARDWARE

The ICEPIC uses all of the functions of the game port into which it is connected: joystick, trigger, and paddles. Normally there is little reason for you to want to "talk" to the ICEPIC except through the driver programs. In fact, the actual operation of the ICEPIC requires some tricky program timing, so you should not even consider running it yourself. However, there are some "status" signals you might be interested in knowing. In particular, you can check if the printer is busy, if it is selected (online for some printers), or if it has a "fault" condition (off-line, out of paper, or serious error for most printers). The exact meaning of these signals varies among printer manufacturers; consult your printer's manual for the exact meanings.

STATUS LOCATIONS AND VALUES

Signal:	BUSY	SELECTED	FAULT
Port 2 Addresses:	STRIG(1)	PADDLE(2)	PADDLE(3)
Port 4 Addresses:	STRIG(3)	PADDLE(6)	PADDLE(7)
"True" Values:	0	> 128	< 128
"False" Values:	1	< 128	> 128

The ICEPIC software will check all of these signals whenever you do a printer operation and it will report an error code if they are not correct. But if you want to check in advance or further determine the cause of a problem from your programs, you can look at the values at any time.

THE JOYSTICK ADDRESS

The "STICK" (joystick) values will have little meaning to you because they are used to pass data to the ICEPIC and to receive acknowledgement from the ICEPIC. You should not write (POKE) to the joystick port because it can cause strange printing to occur. If you run a program which changes the Input/Output control register for the joystick, the ICEPIC may no longer function (until you OPEN a print file, do a SYSTEM RESET or boot the system). Although it's unlikely that you could damage the ICEPIC by modifying the "STICK" settings, it should be avoided.

OTHER INTERFACES

USING ICEPIC WITH A MODEM

If you own an Atari 850 or similar modem-connecting device you are aware of a serious limitation: you cannot simultaneously receive data from a remote system and print it in "real time". This is due to the fact that the 850 "takes over" the I/O channel when it is sending or receiving (or waiting to receive) data from the modem. The ICEPIC can solve this problem for you. As you know, it does not use the channel and is therefore free to print at any time. You can make use of this in two ways...

USING ICEGRAF FOR PRINTING

For many "modem" programs, you need only to previously load ICEGRAF and activate "HARDCOPY" whenever you want to print whatever is going to the screen or you can use the "print screen" function to print what is already on the screen. On higher speed lines you may need a larger input buffer in your modem program (if this is possible) to avoid lost data when waiting for some printer operations. This can be avoided by doing a "print screen" only when the remote system is not actually talking (the 850 still has the channel but no data will come in).

DOING IT ALL YOURSELF

For the more ambitious, there is another route which can give you even more flexibility: your program can open a printer file and print whatever you want, whenever you want. This method requires that you can change the modem program, of course. You can use either PHANDLER or ICEGRAF as your ICEPIC driver.

UTILITY PROGRAMS

In addition to the many driver programs on your ICEPIC software diskette, you will find several "utility" programs which will be useful for several special functions.

ICECHK DIAGNOSTIC

You used this program during your initial checkout procedure. It can be used, at any time, to verify that everything is working. It does not depend on an external ICEPIC driver program, so it can isolate a problem to hardware or software: if the ICEPIC works with the diagnostic but not with another driver, the problem is with the driver (how you are using it, most likely); if the ICEPIC does not work with ICECHK, you will be told the cause of the problem and the likely solution. Since different printer manufacturers use slightly different ways of reporting error conditions, ICECHK cannot be too specific in identifying some problems -- it should catch the common ones. There are two versions of ICECHK:

ICECHK2 -- for ICEPIC connected to port 2.

ICECHK4 -- for ICEPIC connected to port 4.

Two problems which cannot be caught directly by ICECHK are (1) no auto-linefeed (overprinting) and (2) printer in abnormal mode (graphics, for example). The first problem will be obvious when you look at the printout -- change your printer setup switch to correct it (you might need to turn the printer off and on again to make it look at the new setup switch setting). The second problem looks like your printer has just stopped working -- turn its power off, then back on, to correct it. You can get "stuck" in graphics mode by accidentally printing the appropriate printer control sequence or if you abnormally terminate a graphics dump (by booting, for example).

SETUP PROGRAM

The SETUP program allows you to establish ICEGRAF graphic dump parameters before running any application program. It is quite useful with programs which will not allow you to do screen text printing (such as many of the graphic tablet programs). SETUP will allow you to change to compressed dumps, to get shaded dumps and set shade "color" values, and to re-specify the disk dump file name. You must load ICEGRAF before you load SETUP. You can run SETUP by loading it from DOS, or since SETUP is an "INIT" program (runs before the rest of AUTORUN.SYS is loaded), it can be part of an AUTORUN.SYS file to which you append the application you want to run (it will run after SETUP). For many applications you will want to first copy ICEGRAF.xxx to AUTORUN.SYS then copy/append SETUP to AUTORUN.SYS and finally copy/append the application you want to run. Be CAREFUL if the application is already "AUTORUN.SYS" -- rename it first. If you are using a cartridge application, just copy/append SETUP to ICEGRAF as your AUTORUN.SYS. Cartridge programs usually will not give you a chance to load programs except as part of AUTORUN.SYS.

REBOOT PROGRAM

REBOOT allows you to load a driver before you boot up another disk. It starts a boot without requiring that the computer power be turned off, so programs can stay in memory. REBOOT does not clear (zero out) page 6, nor does it re-determine RAM size before it starts the bootup. Thus, anything "hiding" in high memory or page 6 will not be destroyed. In addition, REBOOT does not alter system vectors and parameters, so any currently active device drivers will remain active. Beyond this, REBOOT does a standard boot process, so almost any bootable disk can be REBOOTed. There are two major ways to use REBOOT: you can manually load it after you have loaded the driver you want to use, or you can make the driver an AUTORUN.SYS file and append REBOOT to that. REBOOT must be the last thing you append in your AUTORUN.SYS file since it "RUNs" (no INIT address and the "boot" usually replaces DOS, so nothing more could run). Creating such an AUTORUN.SYS allows you to simply insert the REBOOT diskette, boot it, and then replace it with the diskette you really want to boot.

REBOOT will pause to give you a chance to insert the new diskette. You must REBOOT from drive 1 (like a normal boot). If an initial disk error occurs (like drive not ready), REBOOT will print "BOOT ERROR" and try again. Once the boot process starts, any disk error will "hang" the system and you must start all over (rare occurrence).

REBOOT will only work with high memory or page 6 drivers (other memory will be cleared, thus destroying low memory drivers). If the system being booted uses page 6 at any time, you will not be able to use a page 6 driver. If the system being booted does not respect high memory or requires a full 48k, you cannot use a high memory driver.

Due to a bug in some early OS ROM's, DOS 2 and its derivatives patched some SIO vectors. This patch is removed by REBOOT because DOS will most likely be overlaid by the software you are REBOOTing. The restore of OS vectors may fail if you are being quite fancy and use a non-standard OS: using standard OS or DOS 3 will avoid this problem.

SHOMICRO PROGRAM

SHOMICRO allows you to dump (via ICEGRAF) files created by MicroPainter. It is needed because MicroPainter requires all 48k and so you cannot load ICEGRAF. To use SHOMICRO:

1. While using MicroPainter, save any pictures you want to dump.
2. Boot up your normal DOS.
3. Load ICEGRAF.xxH.
4. Load SHOMICRO.
5. Insert the diskette with your MicroPainter files into your drive.
6. Answer SHOMICRO prompts as desired.

SHOMICRO will first perform a "SETUP" and then ask you for the file you want to display. It will read it and show it to you. While it is on the screen, you can use the ICEGRAF keyboard functions to either dump it to print or write it on disk. After each picture, SHOMICRO will give you a chance to display another file and/or change the SETUP parameters. Any ICEGRAF dumped files will most likely use less disk space than original MicroPainter files because ICEGRAF compresses the data.

DISPLAYING "ARTIST" PICTURES IN BASIC

If you use ICEGRAF to dump a MicroPainter picture (or most other "artist" pictures) to disk, you can write a BASIC program containing the following statements:

```
GRAPHICS 8+16  
OPEN #2,4,0,"G:filename.ext"
```

"filename.ext" is the name of the file you dumped with ICEGRAF (specified during SETUP). You will get a display of your original picture, in its original colors. Thus, you could make a "slide show" of pictures created by your painter or incorporate the pictures as part of a game or other presentation.

SAMPLE APPLICATION REQUIREMENTS

The following application programs have been tested with the ICEPIC and worked with the drivers specified for each. It would be nearly impossible to test all available applications -- if you have one which is not listed, try using the procedure for a listed application which is similar to yours.

In the descriptions which follow, ICEGRAF.xnH, ICEGRAF.xnL, PHANDLER.nLM, PHANDLER.nP6, and SIOSIM.nLM mean you should use the version of the driver which corresponds to your hardware ('x' designates printer graphics type and 'n' the joystick port number). See the chapter on ICEGRAF or PHANDLER for details.

BASIC PROGRAMS

The following procedure will work with most BASIC programs:

1. Before loading or running your program, exit to DOS ("DOS" command).
2. From DOS, load ICEGRAF.xnH (see page 6.1).
3. Return to BASIC (run cartridge) and use BASIC as usual.
4. All of the ICEGRAF functions will be available at the keyboard.
5. Your program can use P: and G: to print and dump.

Any of the ICEPIC drivers will work with "simple" BASIC programs. There are two ways to load a driver: (1) go to DOS and load the driver or (2) make the desired driver your AUTORUN.SYS file. ICEGRAF.xnH works best for most uses (but System Reset destroys the disk dump portion). ICEGRAF.xnL works best as an AUTORUN.SYS if you are not going to get into DOS and run any program from DOS. If you do not want to use the ICEGRAF functions (just want to print) and you need every bit of memory (ICEGRAF uses 4k), you can use PHANDLER.nLM or PHANDLER.nP6 -- they only use around 256 bytes. If your BASIC program does not use page 6, PHANDLER.nP6 gives you the maximum available memory. Remember that loading the low memory drivers (PHANDLER.nLM

or ICEGRAF.xnL) from DOS 2 can be a tricky procedure -- making the driver into your AUTORUN.SYS file is easiest.

If you wish to LIST a BASIC program (or any other kind of program) and it contains "control characters" (many of the Atari special symbols) you should activate "translated" printing to avoid having your printer do strange things. This can be accomplished by adding the following statement to the program being listed:

```
1 REM [Ec][Ec][Ec]GT
```

[Ec] is an escape character -- press the [ESC] key twice to get one. When this line is "printed", ICEGRAF will start using "translated" output. Any control characters will appear as underscored letters and any inverse characters will be italicized (emphasized on Okidata printers). You can also activate translated printing through the ICEGRAF keyboard sequence AFTER you start the listing -- you must be quick if any control characters are near the start of the program.

ATARIWRITER

The following procedures should be used with AtariWriter:

A. If you are not using one of the AtariWriter print drivers, copy PHANDLER.nLM to AUTORUN.SYS on the disk you will boot with AtariWriter.

B. If you are using an AtariWriter print driver, copy SIOSIM.nLM to the AUTORUN.SYS and copy/append your driver to that.

If you want some of the ICEGRAF features (such as Atari font), substitute ICEGRAF.xnL for either PHANDLER or SIOSIM in the previous steps. Note that ICEGRAF will use up 4k more of memory.

LJK LETTER PERFECT

The following procedure works with Letter Perfect:

1. Boot your normal DOS and load ICEGRAF.xnH.
2. Load REBOOT, insert your Letter Perfect diskette and press [Start].
3. After Letter Perfect has booted, press [CTRL]-[Inverse/Video] then I so ICEGRAF will survive if you later must press [SYSTEM.RESET].

Because Letter Perfect uses a non-standard DOS, you should not use the disk functions of ICEGRAF while in Letter Perfect (there is not much need for them).

B/GRAPH

B/GRAPH can be used with the ICEPIC in two ways: (1) use normal B/GRAPH dumping via PHANDLER.NLM or (2) use the SHOW program of B/GRAPH along with ICEGRAF.xnH to get various formats of dumps. ICEGRAF cannot be used with the full-fledged B/GRAPH because there is not enough memory.

To use the normal B/GRAPH print functions:

1. Copy PHANDLER.NLM onto a DOS diskette as AUTORUN.SYS.
2. Boot this diskette with BASIC present.
3. Insert the B/GRAPH diskette.
4. RUN "D:START".

To use ICEGRAF along with B/GRAPH's "SHOW" program:

1. Boot from a normal disk with BASIC present (and no AUTORUN.SYS).
2. Exit to DOS, and load ICEGRAF.xnH.
3. Return to BASIC.
4. Insert the B/GRAPH diskette.
5. Run "D:SHOW".
6. Follow the B/GRAPH instructions to get a display of the chart you want to dump.
7. Use the ICEGRAF keyboard dump commands to make your dumps.

KOALA MICRO ILLUSTRATOR ATARIARTIST

For cartridge based versions do the following:

1. Boot up a normal DOS disk.
2. Copy ICEGRAF.xnL to AUTORUN.SYS on the diskette you will use with your art program.
3. Copy/Append SETUP to AUTORUN.SYS.
4. Insert your cartridge and boot from the diskette.
5. Answer the SETUP questions as desired.
6. Run art program as usual.
7. Use ICEGRAF keyboard dump commands to print or dump the picture.

For disk based versions:

1. Boot up a normal DOS disk.
2. Insert the art program software diskette.
3. Rename the current AUTORUN.SYS to TEMP.PGM.
4. Copy ICEGRAF.xnL to AUTORUN.SYS on the art program diskette.
5. Copy/Append SETUP to the AUTORUN.SYS.
6. Copy/Append TEMP.PGM to the AUTORUN.SYS.
7. Boot from the art program diskette.
8. Answer the SETUP questions as desired.
9. Run art program as usual.
10. Use ICEGRAF keyboard dump commands to print or dump the picture.

Once you have created the necessary AUTORUN.SYS you will only have to do the last four steps in the future. You must SETUP the ICEGRAF graphic dump parameters in advance because these programs never have a text screen where you could "print" the required control information. When you start an ICEGRAF dump to print or disk, the screen may go blank or go into magnified view -- the dump will be of the original picture. When the dump completes, you will usually end up back on the menu page. The menu page will not dump correctly because it uses "display list interrupts" and changes character sets.

If you make a dump to disk, it can be used by BASIC programs if you follow the procedure under "SHOMICRO" (page 9.4). If you need to change the disk dump name, you must reboot and reply appropriately to the SETUP prompts. The first four "shade" values in ICEGRAF SETUP correspond, left to right, with the colors on the menu page. The fifth "shade" value is not used by the art programs (but must be specified -- use 0). A shade value of 0 is "white" (no print). Values of 1, 2 and 3 are progressively "blacker".

MICROPAINTER

ICEGRAF does not work directly with MicroPainter because MicroPainter uses all of memory. However, you can still print your pictures by using SHOMICRO after you have saved your pictures from MicroPainter. See SHOMICRO (page 9.4) for more information.

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ERROR REPORTING

ERROR CODES

The ICEPIC drivers will check for several types of error conditions and report them as error codes when a command for the printer is issued. The following codes are reported:

Code 138 (Device Timeout) means that the ICEPIC is not responding -- it's probably not plugged into the correct game port.

Code 139 (Device NAK) means that the printer is reporting a "fault" or is not "selected" -- it can be caused by several conditions. The printer may be offline, turned off, out of paper, or have a serious hardware problem.

Both of these errors are returned immediately during an OPEN or STATUS operation. If the printer becomes "not ready" during printing, ICEPIC software will start "beeping" the keyboard "buzzer" until you ready the printer or press [BREAK]. The [BREAK] key will cause error code 139 to be reported to the program. Due to memory limitations, the page 6 version of SIOSIM can only perform the OPEN checks -- it may hang temporarily if errors occur during printing (until the error is corrected).

ICEGRAF KEYBOARD COMMANDS

If ICEGRAF detects a printer error condition while doing a keyboard activated command, it will start "beeping" until you ready the printer. If you use [BREAK] to end the "printer not ready" condition, ICEGRAF will stop the current function (there may be a short delay on graphic dumps). In addition, your printer may end up "stuck" in graphics if you were in the middle of a graphic dump or "Atari" font printout. So if your printer goes "off line" during a graphic dump and you decide to terminate the dump (by pressing [BREAK]), you should turn the printer off and back on again to avoid leaving it in graphics mode.



TROUBLE-SHOOTING

There are four major causes of problems encountered while using the ICEPIC:

1. Printer hardware settings and connections.
2. ICEPIC hardware connections.
3. Improper use of ICEPIC software.
4. Actual hardware failures.

When you have a problem, the first thing to do is to determine which class of problem you have. This is most easily accomplished by running the ICECHK diagnostic program.

PRINTER HARDWARE SETUP

Check the following items on your printer:

1. Is it plugged into the power ?
2. Is its power turned on ?
3. Is it ON LINE or SELECTED ?
4. Is it out of paper ?
5. Is it set up to use the parallel interface ? (Option on some printers.)
6. Is the setup switch for automatic linefeed "on" ?
7. Is it "stuck" in graphics mode ? (Turn it off, then on, to reset it.)
8. Has it accepted its setup switch settings ? (Often you must turn it off and on again to get the settings to "take".)

ICEPIC HARDWARE CONNECTIONS

Check the following items:

1. Is the ICEPIC completely plugged into the printer ?
2. Is the ICEPIC completely plugged into the "joystick" port ?
3. Is the ICEPIC plugged into the correct joystick port for the driver in use ?

IMPROPER USE OF ICEPIC SOFTWARE

To determine if you have a software problem, run the ICECHK diagnostic -- if it works, it is likely that you do have a software problem. The most likely software problem is the use of the wrong driver with a given application. The most common such error is the use of a driver which gets destroyed or overlaid by the application or by DOS itself. Reread the sections on selecting a driver and the section pertaining to the driver you are attempting to use. ICEPIC software may not work with some applications, particularly those which use every bit of memory and those which use non-standard ways of accessing Atari hardware.

While somewhat rare, you could destroy a driver on disk by writing over it or perhaps by a disk error. This should be suspected if a driver, which used to work, suddenly does not work the same. Go back and copy the driver from the original ICEPIC diskette if this happens.

One problem area which is not understood by many Atari users is DOS 2's DUP.SYS. This is the program which builds the DOS "menu" and determines what you want to do. To reduce memory requirements, DUP.SYS is loaded when it is used. It loads at a fairly low memory address and can therefore overlay a program (driver) which is loaded in low memory. So if you load a low memory driver from DUP.SYS, it might be destroyed when DUP.SYS comes back to ask you what to do next. DOS supports a function to save anything in low memory to a disk file (MEM.SAV). Since writing this file takes some time and since there must be room for it on the diskette being used, most users do not use it. Even if you do use a MEM.SAV, you must not try to use print (or ICEGRAF) functions while the driver is "swapped out" on disk (while DUP.SYS is active). As a result, it is not usually advisable to load a low memory driver from the DOS 2 menu. If you need to use a low memory driver, you can make the driver an AUTORUN.SYS or part of AUTORUN.SYS. For cartridge programs, DOS will automatically load AUTORUN.SYS (your driver) before it gives control to the cartridge program. For disk based applications, you can copy/append your

application to the driver as part of AUTORUN.SYS; the application will be loaded and run after the driver has been loaded.

ACTUAL HARDWARE FAILURES

Actual hardware failures fall into two groups: intermittent and consistent. In the intermittent category, there can be cases where a letter or two are misprinted and other cases where things stop working for a while. Both of these cases are often due to electrical "noise". Such noise can be caused by plugging the printer and the computer into different power circuits (outlets) or by using some heavy duty appliance on the same circuit. Plugging everything into the same outlet strip and perhaps using a noise suppressing outlet strip can often solve such problems.

Consistent hardware failures are usually more serious but often easier to find -- nothing ever works. There are three pieces of hardware which can fail: the Atari computer, the ICEPIC, and the printer. If a joystick works in the "ICEPIC" jack, the Atari is probably OK. You can check port 2 with the following simple BASIC program (moving the joystick in all directions should give changing values):

```
10 ? STICK(1):GOTO 10      (Use STICK(3) for Port 4)
```

The determination whether the ICEPIC has failed or whether the printer has failed can best be done by substitution. If you can, try the printer on another system with a printer interface which works. Or try using another printer which works on another system. Or, if available, try substituting another ICEPIC. Most printers have a "self test" which will tell you if the printer is bad. Unfortunately, the test will not tell you if the printer is good -- the tests cannot check the parallel interface. Check your printer manual for more suggestions on trouble-shooting. If you are fairly certain the ICEPIC does not work, refer to the ICEPIC warranty for repair policy.

L I M I T E D W A R R A N T Y

Integrated Computer Equipment Company ("ICECO") warrants that this product, the Parallel Interface Converter ("ICEPIC") and the diskette medium, containing the supporting software, is free from defective material and workmanship. Subject to the conditions set forth below, ICECO agrees to repair or replace any ICEPIC or ICEPIC software diskette which proves defective by reason of improper workmanship or materials for a period of ninety (90) days from the original retail purchase date, without charge for parts and labor. After the warranty expires, ICEPIC's will be repaired or replaced for a prepaid flat fee of \$15.00 plus \$4.00 for shipping and handling.

Defective units may be returned, intact and postpaid, to the original seller of such unit or to ICECO directly and must be accompanied by a proof of purchase receipt or, if out of warranty, by a check or money order for \$19.00. ICECO requires that the Problem Reporting Form be filled out by the retail purchaser and returned along with the defective ICEPIC.

While the ICEPIC software has been extensively tested, it is sold "as is" with no warranty, expressed or implied, for any particular purpose. However, if the ICEPIC, with its accompanying software, is totally unacceptable to the original purchaser, the purchase price, less shipping and handling charges, will be refunded upon return, postpaid, of the undamaged ICEPIC, original software diskette, and user's manual, all in the original package, to the seller of this product, subject to the conditions set forth below. This "money back" satisfaction guarantee shall be in effect for a period of thirty (30) days from the original retail purchase date.

These warranties are limited to the original retail purchaser of the ICEPIC. These warranties are not effective unless the ICEPIC was purchased from ICECO, an authorized ICECO dealer or other person authorized by ICECO to sell ICECO products. The ICEPIC and ICEPIC diskette shall not have been subject to accident, misuse, or abuse, nor operated contrary to the instructions contained in the ICEPIC User's Manual. The ICEPIC software diskette's write-protect seal shall not have been removed nor any data written onto the diskette by anyone other than ICECO. The ICEPIC shall not have been previously repaired or altered by anyone other than an ICECO authorized service facility.

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